REMARKS/ARGUMENTS

Introductory comments

The Office Action mailed April 13, 2004 has been reviewed and carefully considered. Claims 5 and 17-27 are canceled. Claims 1 and 29 have been amended. Claims 1-4, 6-16, and 28-38 are pending in this application, with claims 1 and 28 being the only independent claims. Reconsideration of the above-identified application, as herein amended and in view of the following remarks, is respectfully requested.

In the Office Action mailed April 13, 2004, claims 1-4, 6-16, and 28-38 stand rejected under 35 U.S.C. §103 as unpatentable over JP 63-134310 (Takahashi) in view of U.S. Patent No. 5,291,930 (Kikuchi).

Claims 17-27, which were withdrawn from consideration in response to a restriction requirement, have been canceled, without prejudice to being resubmitted in a divisional application.

Improper reliance on Takahashi

The Examiner has supplied only an English abstract of Takahashi along with a copy of the published reference in Japanese. However, the Examiner notes on page 4, lines 9-11 of the Office Action that the details of Takahashi were obtained from the abstract and from an oral translation supplied by a USPTO translator. The Board of Appeals has issued a non-binding opinion in which the Board stated that the Examiner needs to obtain translations for foreign documents cited by the Examiner. *In re Gavin*, 62 USPQ2d 1680 (Bd. Of Appeals 2002). Therefore, the PTO is requested to provide a translation so that applicant is enabled to properly respond to the Examiner's rejection, especially since the Examiner acknowledges reliance on an

oral translation. Otherwise, i.e. without a translation, reliance by the Examiner on this reference must be dropped.

Brief summary of the invention

Before discussing the cited prior art and the Examiner's rejection of the claims in view of that art, a brief summary of the present invention is appropriate. The following summary is based on the specification and is provided for the convenience of the Examiner, and not to argue limitations which are unclaimed.

The present invention relates to a tire having a novel reinforcement element as a substitute for known steel cord reinforcement elements, for example to reduce the weight of the conventional tires made with steel cords. According to the present invention, the reinforcement element is an elongate composite element of monofilament type made of fibers impregnated with resin (see paragraphs [0015] - [0016] of the specification). In order to withstand small radii of curvature (which the reinforcement element is subjected to in the belt of a tire) without damage, it is necessary to obtain a good combination of (i) the properties of the resin (e.g. the resin must ensure sufficient cohesion between the fibers to avoid rapid collapse in compression following microbuckling of the fibers in the resin - see para. [0019]), (ii) the properties of the reinforcement element (e.g. fibers which are balanced in traction and in compression, referred to in the specification as "substantially symmetrical fibers" - see para. [0018]) and (iii) the size of the section of the elongate composite.

Distinctions between claim 1 and Takahashi

Independent claim 1 recites "substantially symmetrical technical fibers". As described above, paragraph [0018] of the specification states that this term defines a fiber that is balanced in traction and compression. Independent claim 1 has been amended to expressly recite "each of said substantially symmetrical technical fibers having an elastic deformation in extension which is substantially equal to the elastic deformation in compression". This is not deemed to constitute a new issue requiring further search and/or consideration because independent claim 1 already recited these limitations. The amendment is intended only to further clarify that the fibers of the elongate composite element have the above characteristics.

The following discussion is based on information disclosed by the English abstract of Takahashi and the information presented in the Examiner's rejection. The abstract of Takahashi discloses a fiber reinforcement material for a pneumatic radial tire. The fiber reinforcement material is made of fiber filaments having the following characteristics: specific gravity of 3.0 or less, tensile strength of 10g/d or more, a tensile modulus of 1200g/d or more, and a thickness of 10,000 D or less. The fiber is impregnated with thermosetting resin having a tensile modulus after hardening of 150 kgf/mm2 or more.

(A) Takahashi does not disclose substantially symmetrical technical fibers:

The disclosure in Takahashi of the above-mentioned characteristics is not tantamount to a disclosure that the fiber is substantially symmetrical. The Examiner states that "Takahashi does suggest an exemplary embodiment in which carbon fibers are used." (See middle of page 3 of the office action.) The English language abstract of Takahashi does not disclose this. However, assuming *arguendo* that Takahashi does disclose the use of carbon

fibers, the use of carbon fibers does not inherently mean that the fibers of Takahashi meet the claim limitations.

The Examiner points to paragraph [0010] of the present specification as suggesting the use of carbon fibers. According to the Examiner's reasoning, since carbon fibers are suggested in the application as being suitable, any carbon fibers must inherently constitute "substantially symmetrical fibers". (See paragraph bridging pages 4 and 5 of the office action.) Thus, the Examiner is not relying only on what is stated in Takahashi. Instead, the impact of Takahashi as a reference is enhanced based on a statement made about carbon fibers in the present specification. Thus, what is or is not said in the present specification becomes a key point in evaluating the reference.

In actuality, paragraph [0010] of the present specification does not suggest that just any carbon fibers may be used. Rather, it expressly states that "certain carbon fibers of low Young's modulus may be suitable" (emphasis added). The Examiner's reasoning breaks down where it relies on the present specification to establish the value of Takahashi as a reference. The present specification makes a conditional statement that (a) applies to only "certain" carbon fibers, and (b) that carbon fibers "may" be suitable. Of course, the critical aspect of the suitability is then disclosed in the present specification as having the various other characteristics, discussed below, in accordance with principles of the present invention.

By skipping over the highly limited nature with which the suitability of carbon fibers is mentioned, the Examiner equates this conditional statement with an absolute teaching that carbon fibers constitute "substantially symmetrical fibers". There is no factual or logical support for such a conclusion. Carbon fibers can be suitable only if they have the other

characteristics which constitute the contribution of the present invention to the prior art. Not all carbon fibers have it.

The present specification clearly states in paragraph [0009] that the fibers used for the present invention are substantially symmetrical technical fibers. The disclosure [alleged disclosure] of carbon fibers in Takahashi does not disclose, teach, or suggest the limitation in independent claim 1 which expressly recites "substantially symmetrical technical fibers". Moreover, as established above, one can not infer from the present specification that just any carbon fiber is suitable and, therefore, a disclosure of carbon fibers in Takahashi is NOT equivalent to a disclosure that carbon fibers are "substantially symmetrical technical fibers".

(B) Other claimed characteristics of the elongate composite element are not obviated by Takahashi:

Independent claim 1 also recites "said elongate composite element having an elastic deformation in compression at least equal to 2%, and having in flexion a breaking stress in compression greater than the breaking stress in extension." The Examiner states on page 2 of the Office Action that Takahashi fails to disclose the claimed characteristics of the elongate composite element regarding (a) the elastic deformation in compression and (b) the breaking stress in compression compared to the breaking stress in extension. Nevertheless, it the Examiner stated position that these properties are dependent on the resin and fiber elements used, and that one of ordinary skill would expect Takahashi to exhibit similar properties (see last five lines on page 2 and first seven lines of page 3 of the Office Action).

With regard to the elastic deformation in compression being at least equal to 2%, Takahashi discloses the use of an Aramid fiber in the specific example. (This information was

obtained from a French translation of Takahashi which is available to the applicant). Kevlar is a Trademark name for Aramid fibers. M.G. Dobb et al., *Compressional behavior of Kevlar fibers*, Polymer, 1981, Vol. 22, July, page 961, second column, submitted concurrently herewith in an IDS, discloses that the limit of elastic deformation for Aramid is 0.5%. Accordingly, Takahasi fails to teach or suggest a fiber having an elastic deformation in compression at least equal to 2%.

With regard to having in flexion a breaking stress in compression greater than the breaking stress in extension, the Examiner states that one of ordinary skill in the art would expect Takahashi to exhibit similar properties. However, Takahashi discloses Aramid fibers which are known to have poor compressional qualities, as stated in the above-mentioned paper by M.G. Dobb et al. Accordingly, one skilled in the art would not expect the breaking stress in compression to be greater than the breaking stress in extension. Therefore, Takahashi does not disclose, teach or suggest in flexion a breaking stress in compression greater than the breaking stress in extension.

Patentability of claim 1 over Takahashi and Kikuchi

The combination of Takahashi and Kikuchi fails to teach or suggest the invention recited in claim 1 for at least the following reasons:

(1) there is no motivation to combine the teachings of Takahashi and Kikuchi, and

(2) Kikuchi fails to teach what Takahashi lacks as pertaining to the present invention.

Regarding the first reason, MPEP §2143 states that to establish a *prima facie* case of obviousness, the prior art reference (or references when combined) must teach or suggest all the claim limitations. Furthermore, the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). The MPEP further

states at §2141.02 (last paragraph) that a prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. Denied*, 469 U.S. 851 (1984).

Kikuchi relates to pneumatic tires having fiber/resin belt cords. The fiber/resin belt cords have elliptical or rectangular cross-sectional shapes so that the fibers have a high modulus of elasticity and excellent flexural fatigue resistance (see col. 2, lines 23-28 of Kikuchi). Kikuchi discloses that the fibers may include Aramid fibers, P.V.A. fibers, glass fibers, and carbon fibers (col. 2, lines 67-68). Resin is impregnated and attached among the filaments to bundle them (col. 3, lines 1-2). Kikuchi specifically teaches that the impregnating resin is required to have modulus in tension of not more than 150 kgf/mm^2 (col. 3, lines 18-20). More specifically, the examples in table 1 in col. 4 of Kikuchi clearly teach the requirement to use a resin with a modulus in extension lower than 150 kgf/mm^2 because the samples with resins having modulus in extension greater than 150 kgf/mm^2 fractured during testing.

In sharp contrast, the English abstract of Takahashi discloses, as mentioned above, that the modulus of tension of the impregnating thermosetting resin is at least 150 kgf/mm^2. Since the allowed ranges of the tensile modulus of the resins in Takahashi and Kikuchi are mutually exclusive, there is no motivation for one skilled in the art to combine any of the features disclosed in Kikuchi with the tire of Takahashi.

As to the second above-mentioned reason, even if the teaching of Kikuchi were to be combined with Takahashi, there is no teaching or suggestion in Takahashi or Kikuchi for impregnating a symmetrical technical fiber using a resin having a modules in extension of at least 2.3 GPa, as recited in as expressly recited in independent claim 1. As stated above, the

alleged disclosure in Takahashi of carbon fibers does not teach or suggest "substantially symmetrical technical fibers". Since Takahashi does not disclose a substantially symmetrical technical fiber, neither Takahashi nor Kikuchi teach or suggest using a resin having a modulus in extension that is 150 kgf/mm^2 or more to impregnate a substantially symmetrical technical fiber. As stated above, a prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. Denied*, 469 U.S. 851 (1984). If the glass fibers of Kikuchi were substituted for the fibers in the tire of Takahashi, Kikuchi teaches that the thermoset resin to be used must be <u>not more than</u> 150 kgf/mm^2 (approximately 1.5Gpa). Accordingly, the combined teachings of Takahashi and Kikuchi fail to teach or suggest using a resin having a modulus in extension that is at least 2.3 GPa to impregnate a substantially symmetrical technical fiber, as recited in independent claim 1.

Furthermore, the Examiner states on page 9, last paragraph, of the office action that the limitations "said elongate composite element having an elastic deformation in compression at least equal to 2%, and having in flexion a breaking stress in compression greater than the breaking stress in extension", recited in independent claim 1, are disclosed in col. 2, lines 15-25 in Kikuchi. However, this section of Kikuchi merely affirms that the modulus in compression may be enhanced without decreasing the modulus in tension. The modulus in compression is a specific property which the Examiner seems to equate with the breaking point in compression. However, these are two different characteristics of the fiber.

The composite includes fibers separated by layers of resin. As the composite undergoes a bending deformation, a resin having a lower modulus of compression will deform to a greater extent than a resin having a higher modulus of compression. The greater deformation of the

resin produces a lower tension and compression strain in the fiber. However, the lower modulus of the resin is associated with a higher probability that a local failure in compression of the resin will occur because the there is a greater decoupling between the resin and the fibers during deformation. Accordingly, it is possible that the breaking point will be reached sooner by using a resin of low modulus. Kikuchi can not be considered to teach or suggest the limitations "said elongate composite element having an elastic deformation in compression at least equal to 2%, and having in flexion a breaking stress in compression greater than the breaking stress in extension", recited in independent claim 1.

In view of the above, it is clear that independent claim 1 is allowable over Takahashi in view of Kikuchi.

Patentability of claim 28 over Takahashi and Kikuchi

Independent claim 28 recites that "at least one reinforcement element is an elongate composite element of monofilament appearance, comprising long glass fibers, said fibers being impregnated in a thermoset resin having an initial modulus of extension of at least 3 GPa, in which said fibers are all parallel to each other, said elongate composite element having an elastic deformation in compression at least equal to 2%, and having in flexion a breaking stress in compression greater than the breaking stress in extension".

The Examiner states that Takahashi discloses a resin with a modulus of at least 1.5Gpa. However, Takahashi can not be considered to disclose that this resin is used on a glass fiber. The Examiner considers the glass fiber to be an equivalent of the carbon fiber. However, as explained above, only select carbon fibers can be considered equivalent to glass fibers, and the general disclosure of carbon fibers in Takahashi (if any) does not disclose glass fibers, based on

available information. Accordingly, the combined teachings of Takahashi and Kikuchi can not be considered to teach or suggest that "at least one reinforcement element is an elongate composite element of monofilament appearance, comprising long glass fibers, said fibers being impregnated in a thermoset resin having an initial modulus of extension of at least 3 GPa".

Takahashi merely discloses using impregnating carbon fibers with a thermoset resin having a modulus of extension of 150 kgf/mm^2 or more. Kikuchi specifically discloses that a glass fiber should be impregnated with a resin having a modulus in extension that is less than 150 kgf/mm^2. Accordingly, the combined teachings of Takahashi and Kikuchi fail to teach or suggest said fibers being impregnated in a thermoset resin having an initial modulus of extension of at least 3 Gpa, as expressly recited in independent claim 28.

In view of the above, it is respectfully submitted that independent claim 28 is allowable over Takahashi in view of Kikuchi.

Patentability of dependent claims over Takahashi and Kikuchi

Each of dependent claims 2-4, 6-16, and 29-38, is dependent on one of independent claims 1 and 28 and, thus, is deemed allowable therewith. In addition, each of these claims includes features which serve to even more clearly distinguish the present invention over the applied references.

For example, dependent claim 3 recites "the thermoset resin has a glass transition temperature T_g greater than 130°C". The Examiner states that Takahashi suggests use of a plurality of high modulus thermosetting resins and that one of ordinary skill in the art would have been able to appropriately select a resin depending on the specific use of the elongate composite element. This statement by the Examiner fails to address the glass transition

temperature. The Examiner further states in the sentence bridging pages 5-6 of the office action, that many of the resins described by Takahashi would have a glass transition temperature greater than 130°C, there being no conclusive showing of unexpected results in the original disclosure to establish a criticality for such as resin.

It is respectfully submitted that the Examiner has failed to establish a *prima facie* case of obviousness for the limitations of claim 3. Section 2142 of the MPEP states that to establish a *prima facie* case of obviousness, three basic criteria must be met: (1) there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art to modify the reference or combine the teachings, (2) there must be a reasonable expectation of success, and (3) the prior art reference or references must teach or suggest all the claim limitations. The rejection of claim 3 fails to establish a *prima facie* case of obviousness because neither Takahashi nor Kikuchi discloses that a glass transition temperature of the resin must be greater than 130°C. In fact, Kikuchi and Takahashi are silent regarding the glass transition temperature of the resin.

The Examiner states that since the resins in Takahashi are similar to the resins identified in the present specification, one of skill in the art would have been able to select an appropriate resin. However, the resins listed in Takahashi are broad names of resins such as epoxy resins. As shown in the resin characteristics in the tables attached hereto, epoxy resins may have a wide range of glass transition temperatures. Accordingly, the mere disclosure of "epoxy resins" in Takahashi fails to disclose anything specific about the glass transition temperature to be used.

Kikuchi similarly fails to teach or suggest specific glass transition temperatures for the resin.

Since neither Takahashi nor Kikuchi teaches any specific glass transition temperature, the rejection of independent claim 3 as unpatentable over Takahashi in view of Kikuchi fails to establish a *prima facie* case of obviousness.

The Examiner further states that there is no conclusive showing of unexpected results to establish criticality of a resin with the claimed glass transition temperature. However, unexpected results are typically used to rebut a *prima facie* case of obviousness. The lack of a conclusive showing of unexpected results to establish criticality does not establish a *prima facie* case of obviousness. Rather the three part test cited above must be met by the PTO. Since neither Takahashi nor Kikuchi teaches any specific glass transition temperature, the Examiner has not shown where the prior art of record teaches or suggests the claimed invention. Accordingly, the rejection of independent claim 3 as unpatentable over Takahashi in view of Kikuchi must be withdrawn, and such action is respectfully solicited.

Dependent claim 29 which depends from independent claim 28, further recites that "said fibers of said elongate composite element have an elastic deformation in extension which is substantially equal to the elastic deformation in compression". As discussed above regarding the rejection of independent claim 1, Takahashi and Kikuchi fail to disclose this limitation. Accordingly, dependent claim 29 is allowable for at least this additional reason.

Conclusion

Entry of this amendment is appropriate because it does not raise any new issues requiring further consideration and/or search. Moreover, it is deemed to place the application in condition for allowance.

Based on all of the above, it is respectfully submitted that the present application is now in proper condition for allowance. Prompt and favorable action to that effect is respectfully solicited.

Should the Examiner have any questions, comments, or suggestions, the Examiner is respectfully requested to telephone the undersigned in order to resolve any outstanding issues.

It is believed that no fees or charges are required at this time in connection with the present application. However, if any fees or charges are required at this time, they may be charged to our Patent and Trademark Office Deposit Account No. 03-2412.

Respectfully submitted,
COHEN, PONTANI, LIEBERMAN & PAVANE

By _____

Thomas Langer
Reg. No. 27,264
551 Fifth Avenue, Suite 1210
New York, New York 10176
(212) 687-2770

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Araldite Epoxy Matrix System

Resin Hardener	LY 5052 HY 5052	LY 3505 XB 3403	LY 3505 XB 3405	LY 3505 XB 3405	LY 564 HY 560	XB 3585 XB3486
Hardener type	Amine	Amine	Amine	Amine	Amine	Amine
Mix ratio (p.b.w)	100 :38	100 :35	100 :35	100 :35	100 :27	100 :32
T_g (glass transition temperature) (°C)	114 – 122	78 – 83	76 - 81	87 –92	70 –85	100 –110
Tensile Modulus (MPa)	3000 –3200	3180 - 3700	3400 - 3700	3500 - 3900	3380 – 3560	2700 - 2900

Resin Hardener	LY 5210 HY 2954	LY 564 XY 2954	LY 556 XY 2962	CY 179 MA XY 917 DY 070	LY 564 HY 906 DY 070	LY 556 XY 917 DY 070
Hardener type	Amine	Amine	Amine	Anhydre	Anhydre	Anhydre
Mix ratio (p.b.w)	100 : 53	100 :35	100 :23	100 : 115 : 2	100 : 95 . 1	100 : 90 : 1
T_g (glass transition temperature) (°C)	220 – 225	148 – 153	156 – 162	204 – 208	165 – 170	150 - 155
Tensile Modulus (MPa)	3000 –3200	3180 - 3700	3400 - 3700	3500 - 3900	3380 – 3560	2700 - 2900

Lonza group

DINISTRON

Epoxy Vinyl Ester Resin

	VE 100	VE 100 ST	VE 250 SC
Tensile Modulus (Gpa)	3.3	3.4	3.6
T_g (°C)	108	106	125

DOW

DERAKANE

Epoxy Vinyl Ester Resin

	8090	8084	411-350	640-900	441-400	470-300	470HT- 400
Tensile Modulus (Gpa)	2.9	2.9	3.2	3.4	3.3	3.6	3.5
T_g (°C)	110	115	120	125	135	165	195

DSM

Atlac

Epoxy Vinyl Ester Resin

	4010	382	590
Tensile Modulus (Gpa)	3.1	3.4	3.5
T_g (°C)	120	135	155